MULTIMEDIA UNIVERSITY®

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023 (2220)

HHG1011 – BASIC HUMAN GENETICS

(All section / Groups)

12 JULY 2023
9.00 a.m. – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **5 pages** with **4 Questions** only.
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please print all your answers in the Answer Booklet provided.
4. You can use calculator in the examination.

Answer ALL questions [40 marks, 10 marks each]

QUESTION 1

(a) Describe TWO events that can activate an oncogene. [1 mark]

(b) Explain how a pharmacogenetic test can improve quality of life for a person with cancer. [1 mark]

(c) What are TWO services that a genetic counselor provides compared to those of physician? [1 mark]

(d) How do preconception comprehensive carrier screening and prenatal diagnosis differ in term of the possible actions that can be taken in response to the test results. [2 marks]

(e) How do *discontinuous* and *continuous* inheritance vary from one another? [1 mark]

(f) How does *genetic drift* differ from *natural selection*? [1 mark]

(g) Individual carrying the dominant allele D have normal finger length while those recessive allele d have short middle finger. In a population with the frequency of dominant allele is 0.4, estimate the probability that a particular individual is heterozygous. [3 marks]

Continued...

QUESTION 2

(a) Identify TWO primary causes of polyploidy. [1 mark]

(b) What is the difference between trisomy 21 and Robertsonian translocation Down syndrome in terms of their chromosomal arrangement? [2 marks]

(c) What is the underlying cause of the expansion of repeating nucleotides that leads to the development of myotonic dystrophy? [1 mark]

(d) Why do some cancers not pass on to the next generations? [1 mark]

(e) How are retinoblastoma type 1, a p53-related cancer, inherited stomach cancer, and BRCA1 breast cancer similar? [0.5 mark]

(f) How do geneticists differentiate between hot spot mutations and founder-effects mutations? [2 marks]

(g) Engaging smoking activity increases double the risk of developing cardiovascular diseases and increase the risk of stroke by five times. How does this activity give such a high impact on cardiovascular diseases? [1 mark]

(h) Could type 2 diabetes turn into type 1 diabetes? Explain your answer. [1.5 marks]

Continued...

QUESTION 3

(a) From where do the first blood cells in human embryos arise? [0.5 mark]

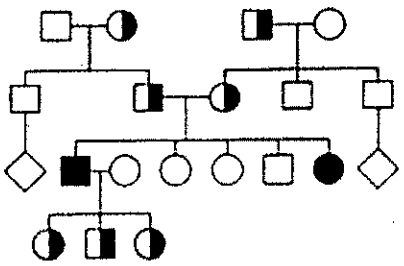
(b) How do oocytes develop and change in the female reproductive system before birth and after the onset of puberty? [1 mark]

(c) Why does telomere shortening cause aging? [1 mark]

(d) What happens if the sex-determining region Y (SRY) gene is absent in the fetus with an XY chromosome? [1 mark]

(e) Given that the father has X-linked dominant trait, what is the chances that his son will inherit the trait? Explain your answer. [1 mark]

(f) What is the pattern of inheritance for the pedigree below?



[0.5 mark]

(g) A farmer wishes to have a good variety of cucumbers on his farm. He crosses a long cucumber that is resistant to infection with a variety that is short and susceptible to infection. Both the traits were pure breed for the trait. The resultant F_1 progenies are then crossed to produce the F_2 generation.

	Trait	Letter
Cucumber size	Long	L
	Short	l
Infection	Resistant to infection	R
	Non-resistant to infection	r

Using the abbreviations shown in the table above, construct a Punnet square and identify

i. The phenotype and gametes produced in F1 generation. [2 marks]
ii. Phenotypic ratio and genotypic ratio in F2 generation expected from this crossing. [3 marks]

Continued...

QUESTION 4

(a) How do allele in a gene originate? [0.5 mark]

(b) How does the elongation step differ between transcription and translation? [1 mark]

(c) Which type of haemoglobin does a fetus have and why? [2 marks]

(d) What mechanism does a prion use to replicate itself? [1 mark]

(e) What allows the selection of cells that have taken up recombinant vectors? Give one example. [1 mark]

(f) What makes retroviruses effective vectors for recombinant DNA experimentation? [1 mark]

(g) What are the THREE most common treatments for lysosomal storage diseases? [1.5 marks]

(h) Describe TWO challenges in gene therapy. [1 mark]

(i) What is the impact of transgenic animals on the environment? [1 mark]

End of paper